What is claimed is:

[Claim 1] 1. A method, comprising:

(a) forming a dielectric layer on a substrate;

(b) forming a capping layer on a top surface of said dielectric layer;

(c) forming a trench through said capping layer, said trench extending toward said substrate and into but not through, said dielectric layer;

(d) forming a sacrificial layer on opposing sidewalls of said trench;

(e) filling said trench with a electrical conductor; and

(f) removing a portion of said sacrificial layer from between said electrical conductor and said dielectric layer to form air-gaps.

[Claim 2] 2. The method of claim 1, further including:

after step (f), (g) forming a sealing layer on a top surface of said capping layer and a top surface of said electrical conductor, said sealing layer covering said air-gaps.

[Claim 3] 3. The method of claim 2, further including:

between steps(f) and (g) forming extended air gaps under said capping layer by removing at least a portion of said dielectric layer adjacent to said air-gaps.

[Claim 4] 4. The method of claim 3, wherein step (g) further includes removing a portion of said dielectric layer in contact with a bottom surface of said electrical conductor, a portion of said dielectric remaining in contact with said bottom surface of said electrical conductor.

[Claim 5] 5. The method of claim 2, wherein said sealing layer comprises a material selected from the group consisting of silicon nitride, silicon carbide silicon oxy nitride and silicon oxy carbide.

[Claim 6] 6. The method of claim 1, wherein said dielectric layer comprises one or more layers, each of said one or more layers comprising a different material selected from the group consisting of hydrogen silsesquioxane polymer, methyl silsesquioxane polymer, poly(arylene) ether, methyl doped silica glass and other low dielectric constant materials.

[Claim 7] 7. The method of claim 1, wherein said capping layer comprises a material selected from the group consisting of silicon nitride, silicon carbide silicon oxy nitride, silicon carbo nitride and silicon oxy carbide.

[Claim 8] 8. The method of claim 1, wherein said sacrificial layer comprises a material selected from the group consisting of silicon oxide and tungsten.

[Claim 9] 9. The method of claim 1, wherein said electrical conductor comprises a copper core, a tantalum layer on sides and a bottom surface of said copper core, and a tantalum nitride layer on sides and a bottom surface of said tantalum layer.

[Claim 10] 10. The method of claim 1, wherein step (c) further includes:

forming a via opening in a bottom of said trench, said via opening extending through said dielectric layer.

[Claim 11] 11. The method of claim 1, further including:

between steps (d) and (e), performing an angled ion implantation into said sacrificial layer only on one of said opposing sidewalls to form ion implanted regions in said sacrificial layer; and

wherein step (f) removes only said ion implanted regions of said sacrificial layer.

[Claim 12] 12. The method of claim 1, wherein:

step (e) includes forming a common surface by planarizing said capping layer, said sacrificial layer and said electrical conductor so that a top surface of said capping layer, exposed surfaces of said sacrificial layer and a top surface of said electrical conductor are coplanar; and

step (f) includes:

forming a co-polymer layer on said common surface;

forming pores in said copolymer layer extending down to said common surface, said sacrificial layer exposed in the bottom of at least a portion of said pores; and

forming extended air-gaps under said capping layer by removing at least a portion of said dielectric layer adjacent to said air-gaps.

[Claim 13] 13. The method of claim 1, further including:

between steps (e) and (f) forming a protective layer on a top surface of said electrical conductor.

[Claim 14] 14. The method claim 13, wherein said protective layer comprises cobalt tungsten phosphide.

[Claim 15] 15. A structure, comprising:

a dielectric layer on a substrate;

a capping layer formed on a top surface of said dielectric layer;

a damascene or dual damascene wire extending below said top surface of said dielectric layer, a top surface of said damascene or dual damascene wire coplanar with a top surface of said capping layer;

a first air-gap between sidewalls of said a damascene or dual damascene wire and said capping layer and a second air-gap between said sidewalls of said damascene or dual damascene wire and said dielectric layer, said first air-gap and said second air gap contiguous to each other; and

a sealing layer on said top surface of said damascene or dual damascene wire and said top surface of said capping layer, said sealing layer bridging across and sealing a top of said first air-gap.

[Claim 16] 16. The structure of claim 15, wherein said second air-gap is aligned with said first air-gap and said first and second air-gaps have about the same width.

[Claim 17] 17. The structure of claim 16, wherein said second air-gap extends under said capping layer, and a pillar of dielectric layer supports said capping layer.

[Claim 18] 18. The structure of claim 15, wherein said second air-gap extends under a bottom surface of said damascene or dual damascene wire and a pillar of dielectric layer supports said damascene or dual damascene wire.

[Claim 19] 19. The structure of claim 154, wherein said sealing layer comprises a material selected from the group consisting of silicon nitride, silicon carbide silicon oxy nitride and silicon oxy carbide.

[Claim 20] 20. The structure of claim 15, wherein said dielectric layer comprises one or more layers, each of said one or more layers comprising a different material selected from the group consisting of hydrogen silsesquioxane polymer, methyl silsesquioxane polymer, poly(arylene) ether, methyl doped silica glass and other low dielectric constant materials.

[Claim 21] 21. The structure of claim 15, wherein said capping layer comprises a material selected from the group consisting of silicon nitride, silicon carbide silicon oxy nitride, silicon carbo nitride and silicon oxy carbide.

[Claim 22] 22. The structure of claim 15, further including:

a portion of a sacrificial layer used in the fabrication of said structure between a bottom surface of said damascene or dual damascene wire and said dielectric layer.

[Claim 23] 23. The structure of claim 22, wherein said sacrificial layer comprises a material selected from the group consisting of silicon oxide and tungsten.

[Claim 24] 24. The structure of claim 15, further including:

a portion of a sacrificial layer used in the fabrication of said structure between a portion of said sidewall of said damascene or dual damascene wire and said dielectric layer.

[Claim 25] 25. The structure of claim 24, wherein said sacrificial layer comprises a material selected from the group consisting of silicon oxide and tungsten.

[Claim 26] 26. The structure of claim 15, wherein said damascene or dual damascene wire comprises a copper core, a tantalum layer on sides and a bottom surface of said copper core, and a tantalum nitride layer on sides and a bottom surface of said tantalum layer.

[Claim 27] 27. The structure of claim 15, further including:

an additional damascene or dual damascene wire, said second air-gap extending between opposing sidewalls of said damascene or dual damascene wire and said additional damascene or dual damascene wire.

[Claim 28] 28. The structure of claim 27, further including:

a portion of a sacrificial layer used in the fabrication of said structure on portions of sidewalls and bottom surfaces of said damascene or dual damascene wire and said additional damascene or dual damascene wire.

[Claim 29] 29. The structure of claim 15, further including:

a protective layer on said top surface of said damascene or dual damascene wire but not on said top surface of said capping layer.

[Claim 30] 30. The structure of claim 29, wherein said protective layer comprises cobalt tungsten phosphide.